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Introduction

The following use cases define the main success scenarios for executing the optimization analysis. The process assumes that the data gathered in UC FPA01-02 through FPA01-04 will require transformation into data matrices suitable for processing by the optimization model. The optimization model will define a cost effective IA organization for the minimum and maximum allowable cost alternatives, and every increment between minimum and maximum, as defined in the FPU analysis parameters. The iterative runs of the optimization model produce a cost effective frontier. Once optimization is complete, it is further assumed that a process is required to interpret the output of the optimization model to create a set of data tables that are usable by the SuD for post-optimization analysis and reporting. The first use case is a summary of the detail use cases that follow. The use cases assume a single, shared process for optimization.

Summary Use Case

Use Case No: FPA01-05

Use Case Name: **Run Optimization Analysis**

Brief Description: ***Run optimization analysis to define the planned initial attack organization.***

Primary Actor: Local Agency Fire Planner
Preconditions: Use Cases FPA 01-01 through FPA01-04 are complete.
Triggers: Local Agency Fire Planner initiates an optimization analysis.

Main Success Scenario:

1. Simulate fire events.
2. Run data transformer.
3. Run optimization analysis.
4. Run data interpreter.
5. Confirm analysis run is successful.

Alternate Flow of Events:

5a Analysis result is unsuccessful.
5a 1 Local Agency Fire Planner(s) is notified.

Policy Recommendations: None

Business Rules:

1. A fire has exceeded initial attack capability if it is not controlled within 48 hours or 300 acres, (Reference: *10-Year Comprehensive Strategy*) or as calculated by the optimization model which means the optimization model cannot keep up with the line building for the perimeter generated by the rate of spread.
2. Cost effectiveness will be measured across all fire management units within the planning unit. There is only one level of optimization: the planning unit.

Assumptions:

1. Where the ratio of weights between two planning units is identical, the optimization model can build equivalence between the two units to allocate resources for determining cost effectiveness.
2. The FPA system may be used to define interagency FMUs or to combine planning units to show efficiencies.
3. The process of determining containment is part of the optimization model, not the fire behavior simulator.
4. The process of determining fire behavior (ROS) is contained in the fire behavior simulator.
5. Use of FPA will not require an understanding of how the mechanism of the optimization model works.
6. The Optimization model will look at each FMU but will do the cost effectiveness analysis for the sum of the FMUs.
7. FPA will not try to simulate all the management decisions that may influence suppression costs and fire containment time into the optimization model. Fires will be contained based on mathematics not on management.
8. The Planner may choose to run the analysis as part of a strategy to explore the definition of the FPU, as well as other reasons.
9. There is a substantial difference between a rear and head attack on a fire. The optimization model does not currently address this difference and assumes a rear attack.

Issues:

1. What will we use for the standard configuration of resources beyond the NWCG minimum?
2. Will the optimization model use actual, historic fire events or an average fire event?
3. See the FPA System PM Requirements Analysis Questions Log

Terms: None

Metadata:

Source:	Requirements Analysis
Author:	Core Team
Date Created:	October 9, 2002
Level:	Business - Summary
Related Use Cases:	FPA01-00, FPA01-05-01, FPA01-05-02, FPA01-05-03, FPA01-05-04
Status:	Reviewed by Core Team
Last Update Date:	January 22, 2003

Detail Use Cases

Use Case No: FPA01-05-01

Use Case Name: **Simulate Fire Events**

Brief Description: ***Run the fire simulator to create the fire matrix table.***
Primary Actor: SuD
Preconditions: All fire history and fire behavior data is input to the SuD.
Triggers: Local Agency Fire Planner(s) initiates optimization run.

Main Success Scenario:

1. The SuD retrieves the historic fire data by FMU.
2. The SuD simulates the growth of each fire and determines the perimeter growth by hour.
3. The SuD populates the data matrix table for fire input data for each fire within the FMU.
4. The SuD run the fire simulator for all FMUs within the FPU.

Policy Recommendations: None
Business Rules: None
Assumptions:

1. Fires do not cross FMU boundaries and the fires do not compete.
2. Fires burn until the end of the time period, measured in hours.

Issues: None
Terms: None
Metadata:

Source:	Requirements Analysis
Author:	Core Team
Date Created:	January 5, 2003
Level:	Business - Detail
Related Use Cases:	FPA01-05
Status:	Reviewed by Core Team
Last Update Date:	January 22, 2003

Use Case No: FPA01-05-02

Use Case Name: **Transform Data.**

Brief Description: ***Transform fire resource and cost data to create the resource matrix.***

Primary Actor: SuD
Preconditions: None identified
Triggers: Use Case FPA01-05-01 is completed successfully.

Main Success Scenario:

1. The SuD verifies that all FPA PM input data is complete and accurate.
2. For each resource, the SuD determines the production rate by hour.
3. For each resource, the SuD determines the hourly cost and fixed cost.
4. The SuD populates the data matrix table for resource input data.

Policy Recommendations: None
Business Rules: None
Assumptions: None
Issues: None
Terms: None
Metadata:

Source:	Requirements Analysis
Author:	Core Team
Date Created:	January 5, 2003
Level:	Business - Detail
Related Use Cases:	FPA01-05
Status:	Reviewed by Core Team
Last Update Date:	January 22, 2003

Use Case No: FPA01-05-03

Use Case Name: **Run Optimization Model**

Brief Description: ***Execute the optimization program to define the optimum set of IA resources.***

Primary Actor: SuD
Preconditions: Use Case FPA01-05-01 is completed successfully.
Triggers: Use Case FPA01-05-02 is completed successfully.

Main Success Scenario:

1. Using the fire input and resource input matrices, the SuD will maximize the sum of weighted acres protected by FMU and FIL.
2. The SuD is constrained by final fire size and total cost.
3. The SuD constrains resource use within FMU based on FMU and resource attributes.
4. The SuD will run the optimization model for each cost alternative (budget level) to determine a single point on the effectiveness frontier. The aggregation of these points is the frontier.

Policy Recommendations: None

Business Rules:

1. The Local Agency Fire Planner(s) may run the optimization multiple time to generate multiple effectiveness frontiers. This allows for comparison of the outcomes of alternative initial attack program scenarios.
2. The optimal effectiveness frontier may be generated to establish a point for comparison to other frontiers, such as the existing effectiveness frontier.
3. The optimum effectiveness frontier is produced by using unconstrained set of geographic-specific fire resources, including the use of replicated fire resources. The existing effectiveness frontier is produced by constraining the fire resources to the existing set of FPU resources.

Assumptions:

- Arrival times are accounted for in the production rates.
- The exact deployment time is not relevant to containment.

Issues: None

Terms:

- Replicated Resources: Fire resources created (replicated from the existing set) by the optimization model to improve effectiveness. These fire resources do not actually exist.

Metadata:

Source:	Requirements Analysis
Author:	Core Team
Date Created:	January 5, 2003
Level:	Business - Detail
Related Use Cases:	FPA01-05
Status:	Reviewed by Core Team
Last Update Date:	January 22, 2003

Use Case No: FPA01-05-04

Use Case Name: **Interpret Data**

Brief Description: ***Interpret the results of the optimization run to create usable data tables.***

Primary Actor: SuD
Preconditions: None identified
Triggers: Use Case FPA01-05-03 is completed successfully.

Main Success Scenario:

1. The SuD retrieves the data that is output from the optimization run.
2. The SuD distributes the data into the analysis results tables.
3. The SuD verifies that the data interpretation was successful.

Alternate Flow of Events:

3a The data interpretation is unsuccessful.
3a 1 The SuD notifies the Local Agency Fire Planner.

Policy Recommendations: None
Business Rules: None
Assumptions: None
Issues: None
Terms: None
Metadata:

Source:	Requirements Analysis
Author:	Core Team
Date Created:	January 5, 2003
Level:	Business - Detail
Related Use Cases:	FPA01-05
Status:	Reviewed by Core Team
Last Update Date:	January 22, 2003